
Recognizing Quality Research and its Importance in Fitness and Wellness

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WHY IS IT IMPORTANT TO STAY UP TO DATE ON LATEST SCIENTIFIC STUDIES?

- **Stay knowledgeable and speak confidently** about research
- **Advance your practice**
- **Detect myths**
- Take **critical look at effectiveness** of new trends
- Research helps **improve human health**
- **Discuss** with clients, colleagues and other health care professionals
- Evidence-informed practice is the **standard across health care**

WHERE TO START

ANECDOTAL VS SCIENTIFIC EVIDENCE

- **Anecdotal evidence**
 - Collected in a **casual or informal** manner
 - Relying on **personal** testimony
 - **Limited** in value
- **Scientific evidence**
 - Tested **objectively**
 - Following scientific **standards**
 - **Controlled** environment
- **“Evidence-based”**=scientific evidence, not anecdotal

WHERE TO START

PEER-REVIEWED

- **Def:** Evaluation of scientific work by others working in the same field
 - The reviewers evaluate the **quality** of the manuscript
 - If appropriate, they suggest **revisions**
 - If they find the article lacking in scholarly validity and rigor, they **reject** it
- **Peer-reviewed journals are deemed superior**

WHERE TO START

1. **Read** articles of interest using trusted sources
2. Think **critically**
3. Join an **evidence-based fitness organization** such as ACSM and NSCA
4. Like the **social media presences** of organizations that publish and discuss latest research:
 - ACSM
 - NSCA
 - Physical Therapy: Practice, Education and Networking
 - British Journal of Sports Medicine (BJSM)
 - Advances in Clinical Education / N.A.
 - NYT – Health
 - Barbell Rehab
 - Unchained Physio
 - Clinical Athlete
 - Breakingmuscle

TYPES OF RESEARCH

RESEARCH BY LEVEL OF EVIDENCE



TYPES OF RESEARCH

DESCRIPTIVE RESEARCH

1. Observational methods
2. Case-study methods
3. Surveys

EXPERIMENTAL RESEARCH

1. Controlled trials
 - Randomized Controlled Trials (RCTs)
2. Uncontrolled trials

TYPES OF RESEARCH

EXPERIMENTAL RESEARCH

- **Controlled trials** - Experimental procedure is compared with another procedure or compared with a control group that doesn't receive any experimental procedure
- **Uncontrolled trials** - Treatment is not compared with another treatment

TYPES OF RESEARCH

RANDOMIZED CONTROLLED TRIAL (RTC)

- Participants are randomly allocated to either **the group receiving the intervention** or to a **group receiving standard intervention (or placebo treatment)** as the control.
- Randomization **minimizes selection bias**
- The different groups determine any effects of the treatment when **compared with the no treatment (control) group**, while other variables are kept constant
- **The RCT is often considered the gold standard for a clinical trial**

TYPES OF RESEARCH

QUALITATIVE / QUANTITATIVE RESEARCH / MIXED METHODS

- **Qualitative research** gathers information that is not in numerical form

It is harder to analyze than quantitative data

- **Quantitative research** gathers data in numerical form which can be put into categories, or in rank order, or measured in units of measurement

Statistical tests can be used for analysis

- **Mixed methods:** Observations and questionnaires can produce both quantitative and qualitative information.

TYPES OF RESEARCH – REVIEWS

LITERATURE REVIEWS

- Provide a **broad overview** of a research topic
- Information is **collected and interpreted unsystematically with subjective summaries of findings**
- Literature is discussed from a **contextual or theoretical** point of view
- Could be subject to **bias**

TYPES OF RESEARCH – REVIEWS

SYSTEMATIC REVIEWS

- Comprehensive review of **all relevant studies** on a particular topic
- Created after reviewing and combining all the information from both published and unpublished studies and **summarizing the findings.**

TYPES OF RESEARCH – REVIEWS

META-ANALYSES

- **Subset** of systematic reviews
- Method for systematically combining study data from several selected studies to develop a single conclusion that has **greater statistical power**
- If the individual studies utilized randomized controlled trials (RCTs) = **highest-level of evidence on the evidence hierarchy**, followed by systematic reviews, which analyze all available studies on a topic

LITERATURE SEARCHES

WHERE TO FIND SCIENTIFIC STUDIES - JOURNALS

RESEARCH JOURNALS

- Publish either **original research papers** or **research review papers**.

PROFESSIONAL JOURNALS

- **NSCA:** 2 printed journal available to members at a reduced fee, a few others free
- **ACSM** publishes 5 journals
- **Other examples:** American Society of Exercise Physiologists: Journal of Exercise Physiology, Journal of Exercise Medicine

WHERE TO FIND SCIENTIFIC STUDIES - ONLINE

- **PubMed** .
- **NCBI**
- **Google Scholar**
- **Libraries of colleges and universities**
 - Provide free service to otherwise paid subscriptions services by publishers such as Elsevier (ScienceDirect) or EBSCO (SportsDiscus).
- **SCI-HUB.IO**
 - Free online search engine with over 58,000,000 academic papers

HOW TO FIND SCIENTIFIC STUDIES

BOOLEAN OPERATORS

- **AND** – *Example:* contemporary AND Pilates
- **NOT** – *Example:* administrator NOT manager
- **Quotes** – *Example:* "ACL injury"
- **Parenthesis** – *Example:* ("low back pain" AND LBP)
- **Combinations** – *Example:* "contemporary Pilates" NOT "classical Pilates" AND ("low back pain" AND LBP)
- ~~**OR** – *Example:* "clinical Pilates" OR "Pilates based"~~

HOW TO FIND SCIENTIFIC STUDIES

OTHER LIMITATION STRATEGIES

- In the last **10 years**
- **English** language only
- Term appears in **abstract and title**
- Term appears in **title**
- Choose **type** of study
- Check **bibliographies** of related studies or reviews

STATISTICAL CONCEPTS TO IDENTIFY STUDY LIMITATIONS

BASIC STATISTICAL CONCEPTS

TRADITIONAL DESIGN

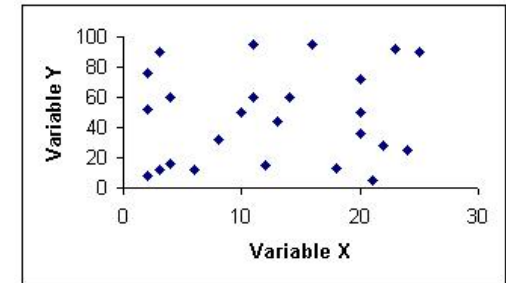
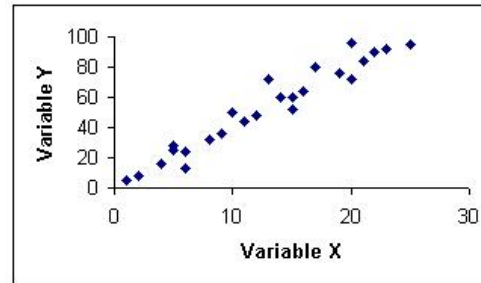
1. **Examine** 2+ groups of participants
2. **Pretest** measure
3. **Apply intervention** to one group
4. **Post-test** measure
5. Look for **statistical differences**

BASIC STATISTICAL CONCEPTS

PROBABILITY

- **Probability (p):** What amount of **correlation** is necessary in order for there to be support for a hypothesis? **What amount is of a measure due to chance?**
- The vast majority of the time the probability level of **0.05**, is used.
- Often expressed as **Statistical Significance** (a result is **determined to be statistically significant**)
- There is no $p = 0.06$ = almost significant
- **Take away: Watch for a p-value equal or smaller than 0.05 in the results section. Greater is bad.**

BASIC STATISTICAL CONCEPTS



CORRELATION (r)

- Quantifying the relationship between 2 variables
- Number between -1.0 and +1.0
- 0 indicating no relationship, 1.0 a perfect correlation
- Correlations can also be **negative** (-1.0=strong negative)
- The stronger the correlation, whether positive or negative, the better the ability to predict
- **Take away: The stronger the correlational values (r) in a study, the more valid it is.**

BASIC STATISTICAL CONCEPTS

VALIDITY

- The ability of a study to reflect the true state of the variables being tested in the population of interest
- Weak **Internal Validity** example: Home exercise program
- Weak **External Validity** example: Small sample size
- **Strong validity is time-consuming and expensive!**
- **Take away: Watch for a study's protocols and how well it does with controlling all the variables in its methods. Also, watch for sample sizes and types.**

BASIC STATISTICAL CONCEPTS

VALIDITY

- **Validity** also plays an important role in choosing **tests or measures**
- Choose the test or measure that most **reliably and accurately** measures your variable.
- Most measures have a **Gold Standard** – the most **accurate current tool to measure** a variable
- Choose tool or protocol with strong correlation (r-value) to gold standard.
- **Take away: Watch for a study's test protocols and check whether the chosen protocols and tools are the most valid ones.**

BASIC STATISTICAL CONCEPTS

RELIABILITY

- The **repeatability** of a test or measure
- **Reliability** is an important **part of validity**

BASIC STATISTICAL CONCEPTS

RELIABILITY

- **Test-retest reliability:** Test scores from day 1 are highly similar to those of another day
- **Interrater reliability (Objectivity):** 2 raters score the same participants on the same test and those scores are correlated. You want these scores to be as close to $r=1.0$ as possible.
- **Take-away: Test-retesting and more than 1 rater are important tools for the strength of a study.**

START YOUR OWN RESEARCH

ORIGINAL RESEARCH STUDY COMPONENTS

- **Abstract:** Summary
 - Hypothesis is the author's expectation of the study.
- **Introduction** describes the purpose of the study
- **Methods:** Detailed description of all procedures
 - Subjects, Procedures, Measures, Statistical Analyses
- **Results:** Objectively presents the findings
- **Discussion:** Interpretation of results related to existing literature
- **Conclusion** section (optional) lists generalizations
- **Bibliography**

WHERE TO START CONTINUED

DEVELOPING A RESEARCH PROPOSAL

1. Identifying the **topic**
2. **Searching the literature**
3. **Identifying the problem**
4. Defining the **research purpose**
5. Stating the **hypothesis(es)** – what do you expect to find based on your research on the topic
6. Plan the research **methods**
7. **Appendices:** prepare informed consents, data collection sheets etc.
8. Submit to **institutional review board (IRB)** for approval

WHERE TO START CONTINUED

IRB REVIEW

- An **Institutional Review Board (IRB)** is a committee that approves, monitors, and reviews biomedical and behavioral research involving humans
- Institutions that have IRBs are **colleges, universities and hospitals**
- There are also **professional IRBs** that provide approval
- Researchers need to complete a **certification** for “training for the protection of human subjects”
- Only a few projects/studies do not need IRB review

WHERE TO PUBLISH

- **Scientific Journals or Professional Journals** (IRB required)
 - Peer-reviewed, the better the higher the “**IMPACT FACTOR**” (average number of citations/year)
- Other **publications from fitness organizations**
- **Magazines** (*Example: FitnessRX for women or men*)
- **Websites** (*Examples: T-nation or breakingmuscle.com*)
- **Blogs**

POTENTIAL STUDY LIMITATIONS

CONSIDER ALL OF THE FOLLOWING

- Are the **instruments** and tests utilized current, calibrated, reliable and valid?
- The **sample** – is the sample size and type appropriate? A small sample size means low statistical power
- Time – are **frequency, length and duration** of the intervention sufficient?
- Are the **data analysis** and the **statistical tests** appropriate?

POTENTIAL STUDY LIMITATIONS

INTERNAL VALIDITY EXAMPLES

- **History:** Participants should not participate in other events that may influence the variables to be measured
- **Selection bias:** Randomization
- **Attrition:** Participants withdrawing from a study
- **Expectancy:** Rater training and multiple raters

EXTERNAL VALIDITY EXAMPLE

- **Reactive effects of experimental setting:** Performance can improve due to being observed (**Hawthorne effect**)

CHALLENGES FOR THE INDEPENDENT RESEARCHER

- **IRB approval:** Find a private IRB (\$\$) if main author is not associated with a college, university or hospital
- **Staffing**
- Finding unpaid **subjects and controls**
- Avoiding potential **conflicts of interest**
- Conducting the **statistical analyses**

AUTHORS AND STUDIES

AUTHORS KNOWN FOR EVIDENCE-BASED PUBLICATIONS

EXERCISE

- Brad Schoenfeld
- Gregory Lehman (Biomechanics, student of Stu McGill)
- Richard Rossiter
- Matthew Bousson
- Ross Enamait
- Tony Gentilcore
- Stu Phillips
- Jim Wendler
- Scotty Butcher
- <http://theptdc.com/> (best monthly fitness articles)

AUTHORS KNOWN FOR EVIDENCE-BASED PUBLICATIONS

PHYSICAL THERAPY

- Antony Lo
- Jarod Hall
- Scot Morrison: <http://scotmorrison.com/therexdatabase/>
- Brent Brookbush
- Joel Crandall
- Paul Ingraham (skeptical approach to the prevention and treatment of common aches, pains, and injuries)
- Juggernaut/Quinn Henoch

AUTHORS KNOWN FOR EVIDENCE-BASED PUBLICATIONS

NUTRITION

- Al Aragon
- James Krieger
- Asker Jeukendrup

OTHER MODALITIES

- Ariana Rabinovitch (Yoga and research)
- Joe Miller (Yoga)
- Thomas Myers (Fascia)
- Robert Schleip (Fascia)

STUDIES

EXCESS POSTEXERCISE OXYGEN CONSUMPTION AFTER HIGH-INTENSITY AND SPRINT INTERVAL EXERCISE, AND CONTINUOUS STEADY-STATE EXERCISE

METHODS

Experimental Approach to the Problem

A randomized, crossover with repeated-measures design was used for this study. Each subject performed 3 separate exercise protocols (HIE, SIE, and SSE) and 1 control condition in random order with at least 72 hours between trials to avoid carryover effects. This design strengthened internal validity and allowed us to test our hypothesis and ensure practical application of the results. During and for 3 hours after each trial, $\dot{V}O_2$ and EE were measured to assess differences between conditions for net O_2 consumed and EE. Subjects were instructed to not exercise or consume caffeine or alcohol >48 hours before each visit. Trial order for the 4 experimental conditions was randomized for all subjects using a random number generator. Sample size ($n = 10$) was determined based on previous studies that have assessed EPOC and fat oxidation differences between exercise protocols (7,8,13,33).



STUDIES

REVIEW ARTICLE

Core Stability in Athletes: A Critical Analysis of Current Guidelines

Research has focused on injury prevention and increasing athletic performance. We analyzed the guidelines for so-called functional strength training for back pain prevention and found that programs were similar to those for back pain rehabilitation; even the arguments were identical. Surprisingly, most exercise specifications have neither been tested for their effectiveness nor compared with the load specifications normally used for strength training. Analysis of the scientific literature on core stability exercises shows that adaptations in the central nervous system (voluntary activation of trunk muscles) have been used to justify exercise guidelines. Adaptations of morphological struc

STUDIES

A Systematic Review of the Effects of Exercise and Physical Activity on Non-Specific Chronic Low Back Pain

Table 1. Aerobic exercise intervention programmes for NSCLBP patients.

Reference Number	Type of Population	Length of Intervention	Effect on Back Pain	Significance Levels
(Hoffman <i>et al.</i> , 2005) [63]	8 individuals with NSCLBP (4 male, 4 female)	25 min of cycle ergometry. 5 min at 50% peak oxygen uptake, then 20 min at 70% peak oxygen uptake	Pressure pain test. Pain significantly decreased by 28% at 2 min and 22% at 32 min post exercise compared to pre-exercise values. No gender/age differences in results	$p < 0.05$
(Shnayderman & Katz-Leurer, 2013) [16]	52 sedentary NSCLBP patients aged 18-65 years	Experimental group (walking on treadmill at 50% heart rate reserve). Control group: specific low back strengthening exercises. Both twice a week for 6 weeks	Low Back Pain Functional Scale: Significantly improved by 20% in experimental group and 15% in control group. No gender/age differences in results	$p < 0.05$
(Chan <i>et al.</i> , 2011) [15]	46 NSCLBP patients (10 male, 36 female)	8-week intervention. Both intervention and control groups received conventional physiotherapy. Intervention group only also prescribed aerobic exercise (40%-60% heart rate reserve)	Visual Analogue Scale (VAS): Intervention group: 47% significant reduction post intervention. Control: 42% significant reduction post intervention. No gender/age differences in results	$p < 0.001$

STUDIES

Effects of Pilates-Based Exercises on Pain and Disability in Individuals With Persistent Nonspecific Low Back Pain: A Systematic Review With Meta-analysis

● **METHODS:** Searches of Medline, CINAHL, Embase, Cochrane library, PEDro, and ProQuest Dissertations and Thesis databases were conducted. Randomized controlled trials (RCTs) were selected and reviewed if they compared pain and disability in individuals with persistent nonspecific low back pain who were treated with Pilates exercises compared to other treatment approaches. Quality of the trials was evaluated. Data for pain and disability scores were extracted. Narrative synthesis plus meta-analyses were performed, with either a fixed-effects or random-effects model, standardized mean differences (SMDs), and tests for heterogeneity.

forms of exercise for pain (pooled SMD, 0.03; 95% CI: -0.52, 0.58; $P = .92$) or disability scores (pooled SMD, -0.41; 95% CI: -0.96, 0.14; $P = .14$).

● **CONCLUSION:** Pilates-based exercises are superior to minimal intervention for pain relief. Existing evidence does not establish superiority of Pilates-based exercise to other forms of exercise to reduce pain and disability for patients with persistent nonspecific low back pain. However, the relatively low quality of existing studies and the heterogeneity of pooled studies in this systematic review combine to suggest that these results should be interpreted with caution.

● **LEVEL OF EVIDENCE:** Therapy, level 1a-.

THANK YOU
